

WHAT IS CLAIMED IS:

1. A method of interconnecting a network infrastructure via a plurality of communication links comprising:
classifying the plurality of communication links according to a link affinity grouping;
enabling and disabling selective ones of the plurality of communication links according to the link affinity grouping; and
activating a particular link selected from among the enabled communication links using a selection process adapted to characteristics of the link affinity grouping.
2. The method according to Claim 1 further comprising:
analyzing performance of the enabled communication links individually and in aggregate.
3. The method according to Claim 2 further comprising:
determining whether the aggregate performance has declined to below a predetermined limit.
4. The method according to Claim 3 further comprising:
generating an alert signal when the aggregate performance declines to below the predetermined limit.
5. The method according to Claim 2 further comprising:
identifying an individual link wherein, based on the analysis, disabling of the identified link from the aggregate in the link affinity grouping will improve aggregate throughput.
6. The method according to Claim 5 further comprising:
automatically disabling the identified link.

7. The method according to Claim 5 further comprising:
recommending disabling of the identified link.
8. The method according to Claim 2 further comprising:
recommending, based on the analysis, appropriate individual links for inclusion
into a link affinity grouping based on criteria selected from among a group
consisting of: potential throughput, link path security ratings, logical unit
(LUN) group criticality ratings, potential throughput according to the link
selection process, link cost, link availability, primary and secondary
replication classification, inclusion or exclusion of multiple link affinity
groups, inclusion of partial or full link affinity groups, and link direction.
9. The method according to Claim 2 further comprising:
determining, based on the analysis, whether altering assignment of links of two
link affinity groups will improve throughput of both groups.
10. The method according to Claim 2 further comprising:
selecting a link for activation in a data replication operation comprising:
maintaining a list of available links;
including a link on the list when the link becomes available;
activating the next available link on the list;
sending information over the activated next available link;
receiving the sent information at a remote site; and
reordering the received information into a proper order at the remote site.
11. A method of communicating data in a network infrastructure via a
plurality of communication links comprising:
interconnecting a plurality of communication links between a local array and a
remote array;
maintaining a list of links available to carry the data;
including a link on the list when the link becomes available;
activating the next available link on the list; and
sending data over the activated next available link.

12. The method according to Claim 11 further comprising:
receiving the sent data at the remote array; and
reordering the received data into a proper order at the remote array.
13. The method according to Claim 12 further comprising:
destaging the reordered data to disk in a data replication application.
14. A storage system comprising:
an interface capable of interconnecting a network infrastructure via a plurality of
communication links, the plurality of communication links having a
diversity of data-carrying capacity and performance; and
a controller coupled to the interface that assigns the plurality of communication
links into at least one link affinity group based on performance criteria and
controls link selection based on link affinity group assignment.
15. The storage system according to Claim 14 wherein:
the controller analyzes performance of the enabled communication links
individually and in aggregate.
16. The storage system according to Claim 15 wherein:
the controller manages synchronous and unordered asynchronous disk array
replication by communicating data over all available links in a round-robin
order, determines whether the aggregate performance has declined to
below a predetermined limit, and generates an alert message for
performance declines below the limit.
17. The storage system according to Claim 16 wherein:
the controller identifies individual links wherein, based on the analysis, disabling
of the identified link from the aggregate in the link affinity grouping will
improve aggregate throughput.

18. The storage system according to Claim 15 wherein:
the controller manages ordered asynchronous disk array replication by enabling and disabling selective ones of the plurality of communication links according to the link affinity grouping, and activating a particular link selected from among the enabled communication links using a selection process adapted to characteristics of the link affinity grouping.
19. The storage system according to Claim 18 wherein:
the controller selects a link for activation in a data replication operation by:
maintaining a list of available links;
including a link on the list when the link becomes available;
activating the next available link on the list;
sending information over the activated next available link;
receiving the sent information at a remote site; and
reordering the received information into a proper order at the remote site.
20. The storage system according to Claim 18 wherein:
the controller determines whether the aggregate performance has declined to below a predetermined limit, and generates an alert message for performance declines below the limit.
21. The storage system according to Claim 18 wherein:
the controller determines appropriate individual links for inclusion into a link affinity grouping based on criteria selected from among a group consisting of: potential throughput, link path security ratings, logical unit (LUN) group criticality ratings, potential throughput according to the link selection process, link cost, link availability, primary and secondary replication classification, inclusion or exclusion of multiple link affinity groups, inclusion of partial or full link affinity groups, and link direction.

22. The storage system according to Claim 18 wherein:
the controller identifies individual links wherein, based on the analysis, disabling
of the identified link from the aggregate in the link affinity grouping will
improve aggregate throughput.
23. The storage system according to Claim 18 wherein:
the controller determines, based on the analysis, whether altering assignment of
links of two link affinity groups will improve throughput of both groups.
24. The storage system according to Claim 15 wherein:
the controller manages disk array replication using a protocol converter by
communicating data over all available links in a round-robin order over
identical throughput links.
25. An article of manufacture comprising:
a controller usable medium having a computable readable program code embodied
therein for interconnecting a network infrastructure via a plurality of
communication links, the computable readable program code further
comprising:
a code capable of causing the controller to classify the plurality of
communication links according to a link affinity grouping;
a code capable of causing the controller to enable and disable selective
ones of the plurality of communication links according to the link
affinity grouping;
a code capable of causing the controller to activate a particular link
selected from among the enabled communication links using a
selection process adapted to characteristics of the link affinity
grouping; and
a code capable of causing the controller to analyze performance of the
enabled communication links individually and in aggregate.

26. The article of manufacture according to Claim 25 further comprising:
a code capable of causing the controller to determine, based on the analysis,
appropriate individual links for inclusion into a link affinity grouping
based on criteria selected from among a group consisting of: potential
throughput, link path security ratings, logical unit (LUN) group criticality
ratings, potential throughput according to the link selection process, link
cost, link availability, primary and secondary replication classification,
inclusion or exclusion of multiple link affinity groups, inclusion of partial
or full link affinity groups, and link direction.
27. The article of manufacture according to Claim 25 further comprising:
a code capable of causing the controller to maintain a list of available
links;
a code capable of causing the controller to include a link on the list when
the link becomes available;
a code capable of causing the controller to activate the next available link
on the list;
a code capable of causing the controller to send information over the
activated next available link;
a code capable of causing the controller to receive the sent information at a
remote site; and
a code capable of causing the controller to reorder the received
information into a proper order at the remote site.
28. An article of manufacture comprising:
a controller usable medium having a computable readable program code embodied
therein for communicating data among a network infrastructure via a
plurality of communication links, the computable readable program code
further comprising:
a code capable of causing the controller to interconnect a plurality of
communication links between a local array and a remote array;
a code capable of causing the controller to maintain a list of links available
to carry the data;

a code capable of causing the controller to include a link on the list when the link becomes available;
a code capable of causing the controller to activate the next available link on the list; and
a code capable of causing the controller to send data over the activated next available link.

29. The article of manufacture according to Claim 28 further comprising:
a code capable of causing the controller to receive the sent data at the remote array;
a code capable of causing the controller to reorder the received data into a proper order at the remote array; and
a code capable of causing the controller to destage the reordered data to disk in a data replication application.

30. A storage system comprising:
means for interconnecting a network infrastructure via a plurality of communication links;
means for classifying the plurality of communication links according to a link affinity grouping;
means for enabling and disabling selective ones of the plurality of communication links according to the link affinity grouping;
means for activating a particular link selected from among the enabled communication links using a selection process adapted to characteristics of the link affinity grouping;
means for analyzing performance of the enabled communication links individually and in aggregate; and
means for determining whether the aggregate performance has declined to below a predetermined limit.